[telecom] mask is displayed in an M+1 color.

Remarks

By this amendment, Applicants have amended the specification to correct reference numerals to match the drawing figures and a grammatical error, amended claims 3 and 10 and requested a three month extension of time.

Applicants respectfully point out to the Examiner that the instant application contains 18 claims and not the 14 claims examined by the Examiner. Claims 15-18 appear on page 14 of the instant application.

The Examiner has rejected claims 3, 4, 10 and 11 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recited the limitation "said telecom mask" in page 10, lines 27-28. There is insufficient antecedent basis for this limitation in the claim.

Claim 4 is dependent on claim 3; therefore it is rejected for the same reason.

Claim 10 recites the limitation "said telecom mask" in page 13, lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claim 11 is dependent on claim 10; therefore it is rejected for the same reason.

The Examiner has rejected claims 1, 2, 5-9 and 12-14 under 35 U.S.C. 103(a) as being unpatentable over Flakne et al. in view of Klingman.

As per claim 1 and 8, Flanke et al. teach a test and measurement instrument (i.e. oscilloscope) for multi-channel mask testing (see col. 6, lines 29-42): a group of M signal input terminals for receiving M signals from a circuit under test and an acquisition system coupled to the signal input terminals for acquiring samples of a waveform at each of the M signal input terminals (see col. 9, lines 4-57); a memory for storing waveform samples and mask pixel data, mask pixel data including an identification code (i.e. identification bits) (see col. 10, lines 54-65); and display circuitry for simultaneously displaying a representation of the mask and all of the waveforms from the M signal input terminals (see col. 6, lines 18-59). Flanke et al. further teach a multiplexer having N input channels and M output channels, where N is greater than M, and M is greater than one, for selecting ones of the N-channels in the groups of M-channels at a time in response to a first control signal; each of the N input channels being coupled to receive a signal from a respective one of the N output channels of a circuit under test. Flanke et al. fail to explicitly teach a comparison

circuitry for reading a memory location, and determining if any acquired waveform sample of the signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel, causing a mask violation. Klingman teaches this feature (see col. 4, lines 10-23; col. 4, line 52 to col. 5, lines 12; and col. 5, line 24 to col. 6, line 53). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Klingman's teaching into Flanke et al.'s invention because it would identify the type of the pixel that needs to be stored in the pixel memory location; it would prevent copying a waveform sample into a mask pixel; therefore it would avoid mask violations.

As per claims 2 and 9, Flanke et al. further teach a rasterizer; memory is a raster memory; comparison is performed by the rasterizer examining pixel data of the raster memory for the identification code as waveform samples are composited into the raster memory; and the comparison being performed sequentially on a waveform basis (see col. 6, lines 7-60 and col. 10, lines 54-65).

As per claims 5 and 12, Flanke et al. further teach that controller generating mask pixels is a microprocessor (see col. 16, lines 5-15).

As per claims 6 and 13, Flanke et al. further teach that controller generating mask pixel is a dedicated ASIC (i.e. look-up-table 35 which is a library provided by the manufacturer) (see col. 9, line 47 to col. 10, line 26).

As per claims 7 and 14, Flanke et al. further teach that the test and measurement instrument is a digital oscilloscope (see col. 10, lines 4-26).

The prior art made of record by the Examiner and not relied upon is considered pertinent to applicants' disclosure.

Yost et al. ('115) disclose a method of controlling rightness and contrast ina raster scan digital oscilloscope.

Sullivan et al. ('374) disclose sparse vector rasterization.

Vertregt et al. ('842) disclose method and apparatus for improving time variant image details on raster display.

Everett et al. ('607) disclose a multi-format on screen monitor.

Applicants' claimed invention is a test and measurement instrument for multi-channel testing having a group of M signal input terminals from receiving M signal from a circuit under test. The M signal input terminals are coupled to an acquisition system that acquires samples of a waveform at each of the M signal input terminals representing each of the received M signals. The waveform samples and mask pixel data generated by a

controller defining a mask are stored in a memory. Comparison circuitry reads a memory location and determines if any acquired waveform sample of the signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel and causing a mask violation. Display circuitry simultaneously displays a representation of the mask and all of the waveforms from the M signal input terminals.

Flakne et al. teaches an oscilloscope design that improves the processing of acquired voltage-versus-time data through the efficient high speed acquisition and rasterization of that data into a form that includes multiple-bits-per-pixel intensity information. The teaching of Flinke et al. describes the basic hardware architecture shown and described in Figure 2 of the instant application. As stated in Flinke et al., more than one channel can be multiplexed into one acquisition memory and rasterization section. The raster combiner can demultiplex these multiple channels, and through the use of extra "tag" bits in each pixel location of the display raster memories, cause them to be displayed as separate channels on the rester display. The tag bits allow the channels to be prioritized, or "layered", so that only the intensity of the one on top is displayed when two or more channels overlap. Alternately, the intensities from two or more channels can be added together when they overlap, if so desired. The raster combiner can also be made to translate intensity variations into color variations, with appropriate supportive changes being made in the display raster memories and the raster display, if desired. (Column 6, lines 29-46). The hardware in Figure 2 of the instant application shows a multi-function raster decay which is not shown in Flinke et al. However, Flinke et al. refers to the possibility of an exponential decay being applied to the accumulating raster memory contents between display updates. The one thing that Flinke et al. does not teach, hint, nor suggest the is the generation of mask pixel data by a controller to define a mask as suggested by the Examiner. The section in Flinke et al. cited by the Examiner with regard to the generating a mask pixel date actually describes the rasterization process where appropriate samples from the acquisition memory are accessed according to addresses generated by an address controller. The address controller receives time-per-division settings and is able to convert the time-per-division setting into addresses that reflect the desired combination of compression width and acquisition depth that will be included in the determination of the intensity of each pixel. There in nothing in the above description that teaches, hints nor suggests that the rasterization process generates mask pixel data. Further, the rasterizer in the instant application is modified to include comparison circuitry for reading a memory location and determining if any acquired waveform sample of the

signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel and causing a mask violation.

The examiner further asserts that Flanke et al. teaches a multiplexer having N input channels and M output channels, where N is greater than M, and M is greater than one, for selecting ones of the N-channels in the groups of M-channels at a time in response to a first control signal; each of the N input channels being coupled to receive a signal from a respective one of the N output channels of a circuit under test. Flanke et al. does not teach, hint, or suggest the use of a multiplexer having M output channels that is coupled to M input channels of a test and measurement instrument. The claimed invention recited in claim 8 is shown in Figure 5 of the instant application and shows N:4 multiplexer 520 having output channels coupled to the input channels of an oscilloscope with mask testing. Flanke et al. does not show such a figure nor does Flanke et al. discuss in the specification a multiplexer having output channels coupled to the input of an oscilloscope or any other test and measurement equipment.

Klingman teaches a digital signal processing apparatus for acquiring framing bit data from an ISDN signal and applying the framing bit data to a display having a mask. The framing bit data is sampled and scaled and stored in processed signal buffer. The scaled framing bit data is presented to an image formatter and pixel mapper where it is bitmapped into suitable form for bit map display. The bit-mapped image data is copied into a copy memory. A template memory stores mask image data. In operation, the framing bit data is acquired, scaled and stored in the process signal buffer. The template data is retrieved from the template memory and is transformed by the pixel mapper and stored in a local display memory. Each of the processed and stored framing bit data waveforms is retrieved, formatted and transformed by the pixel mapper and stored in the local display memory. Following each display of one of the framing bit waveforms, the signal data stored in the copy memory is retrieved, and each bit is inverted and written to the display memory over the existing data therein. The inverted framing bit data erases any data bit appearing in the corresponding pixel location, thereby causing not only the original signal trace to be erased in the display memory, but also any portion of the mask over which the trace was written causing the mask to appear eroded.

Klingman does not teach, hint nor suggest using comparison circuitry for reading a memory location and determining if any acquired waveform sample of the signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel and causing a mask violation. Klingman generates an inverted identical framing

bit data waveform to the framing bit data waveform displayed on the display and writes the inverted waveform data into the display memory. The result is erasing the existing framing bit data and any portion of the mask that the framing bit data impinges upon. There is no comparison circuitry in Klingman that causes a mask violation when any acquired waveform sample of the signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel as is recited in applications' claimed invention.

Combining the teachings of Flanke et al. with Klingman does not render obvious the claims of Applicants' invention. Neither Flanke et al. nor Klingman teach, hint nor suggest comparison circuitry for reading a memory location and determining if any acquired waveform sample of the signal from each of the M signal input terminals is to be written into a memory location currently storing a mask pixel and causing a mask violation. Further combining mask and display process of Klingman with Flinke et al. does not display a representation of the mask and all of the said waveforms from the M signal input terminals. Any violation of the mask as taught by Klingman will erase a portion of the mask whereas Applicants' claim invention recites simultaneously displaying a representation of the mask and all of the said waveforms from the M signal input terminals. As the mask is eroded as taught by the Klingman teaching, a user would not be able to tell which of the waveforms from the M signal input terminals is violating the mask.

In view of the amendments to claims 3 and 10 and the accompanying remarks, Applicants respectfully request the Examiner withdraw the rejection of claims 3, 4, 10 and 11 under 35 U.S.C. 112, second paragraph, claims 1, 2, 5-9 12-14 under 35 U.S.C. 103(a) and unexamined claims 15-18 and pass this case to issue.

Respectfully submitted,

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MARKED-UP REPLACEMENT PARAGRAPHS

Page 3, paragraph starting at line 26.

In operation, oscilloscope **130** acquires a signal and determines if the signal has passed or failed the mask test. This sequence is then repeated N times, for example, sixty-three times, to check each channel of line card **110**. Multiplexer **120** and oscilloscope **130** are under control of a GPIB controller **140**. GBIB controller **140** may be a microprocessor, microcomputer, or a dedicated ASIC controller, having GPIB (general purpose interface bus) control capability. In the apparatus of FIGURE 1, only one channel at a time is tested against the mask. Therefore, GPIB CONTROLLER **140** must send sixty-three separate switching control commands [must] to MULTIPLEXER **120**. If settling time is required after each multiplexer switch selection, then the total time for testing the entire LINE CARD **110** increases accordingly. Understandably, speed in testing of multi-channel line cards is of critical importance to the telecom industry.

Page 6, paragraph starting at line 7.

FIGURE 4 shows two parts of a typical telecom mask **410, [430]** <u>420</u> displayed on a display screen of an oscilloscope. Controller **230** of FIGURE 2 draws the telecom mask into display memory. It is drawn as a series of polygons (e.g. trapezoids) defined by a series of stored X-Y points. The telecom mask may be drawn into either of two memory planes depending upon its ultimate purpose. If the purpose is simply to view the telecom mask, or to move it about the screen, then it is drawn into VECTOR PLANE **354**. However, if the purpose is to perform a comparison with waveform data as in copending U.S. Patent Application Serial Number 09/602,575 entitled A TEST AND MEASUREMENT INSTRUMENT HAVING TELECOMMUNICATIONS MASK TESTING CAPABILITY WITH AN AUTOFIT TO MASK FEATURE, (Letts), (herein incorporated by reference) then the telecom mask is drawn into the GS PLANE **352**. This is required because the rasterizer must have access to both the waveform data and the telecom mask data in order to detect violations (i.e., make a collision determination) between the two, as the pixels are being drawn into GS PLANE **352** of RASTER MEMORY **350**.

Page 6, paragraph starting at line 21.

Referring to FIGURE 4, a display screen **400** of a digital oscilloscope, or the like, has displayed thereon, a telecom mask having an upper portion **410** and a lower portion

[430] **420**. Each of upper portion **410** and lower portion **[430]** **420** comprises individual segments composed of polygons (e.g., trapezoids).

Page 6, paragraph starting at line 25.

Assume that an AUTOSET TO MASK feature has placed telecom mask **410, [430]** **420** on the display screen (written it into RASTER MEMORY **250**) and has acquired and adjusted waveforms **430, 440, 450, and 460** to nominal values. A portion of the AUTOFIT TO MASK function (referred to above) now takes control, and prevents decay of any pixel data in the mask area (so that the mask does not have to be continually redrawn).